

WHAT IS CLAIMED IS:

1. A circuit board biosensor apparatus comprising:
  - 5 a plurality of working and reference electrodes formed thereon;
  - a plurality of nucleic acid segments attached to the surface of said plurality of working electrodes; and
  - 10 a monitor for measuring a current produced when an electric potential is applied to the working electrode after the attached nucleic acid segments are hybridized to nucleic acid targets wherein said monitor is operably connected to said circuit board.
- 15 2. The biosensor apparatus of claim 1 wherein the circuit board is a printed circuit board or a screen printed circuit board.
- 20 3. The biosensor apparatus of claim 2 further comprising a multiplexed potentiostat to measure current generated by each of said nucleic acid segments hybridized to different target nucleic acids.
- 25 4. The apparatus of claim 1 wherein the amperometric monitor is a pulse amperometric monitor.
- 30 5. The biosensor apparatus of claim 4 wherein the pulse amperometric monitor comprises a dual sensor array that simultaneously detects and quantitates a plurality of targets.
- 35 6. The biosensor apparatus of claim 5 wherein the amperometric monitor comprises pulse and intermittent pulse modes.
7. The biosensor apparatus of claim 1 further comprising an electrochemical pulse analyzer operably linked to said plurality of electrodes.
8. The biosensor apparatus of claim 1 further comprising a touch memory chip.
9. The biosensor apparatus of claim 1 further comprising a liquid crystal display.
- 40 10. The biosensor apparatus of claim 1 further comprising an integrated microprocessor for changing parameters, saving and analyzing data.
11. The biosensor apparatus of claim 1 further comprising a single-key start operation.
- 45 12. The biosensor apparatus of claim 1 which is comprised within a kit for detecting a nucleic acid having at least one selected nucleic segment wherein said kit includes a instructions for use of said electrode to electrochemically detect the selected nucleic acid.

13. The biosensor apparatus of claim 1 wherein the nucleic acid segments are hybridized with single strand DNA generated from an amplified genomic DNA sample digested with an exonuclease.

5 14. The biosensor apparatus of claim 1 wherein each of said plurality of nucleic acid segments is labeled and selectively hybridizes to different target nucleic acids.

10 15. The biosensor apparatus of claim 1 which is comprised within a kit for detecting a nucleic acid having at least one selected nucleic segment wherein said kit includes instructions for use of said electrode to electrochemically detect the selected nucleic acid.

15 16. The biosensor apparatus of claim 1 wherein the nucleic acid segments are hybridized with single strand DNA generated from an amplified genomic DNA sample digested with an exonuclease.

20 17. A candidate drug that modulates cell function wherein said candidate drug is identified by the following steps, comprising,

25 (a) incubating a candidate drug with a culture of selected cells;

(b) extracting nucleic acids from said cells;

30 (c) contacting the nucleic acids of step (b) with the circuit board biosensor apparatus of claim 1;

(d) applying a pulsed electrical potential to the array; and

35 (e) comparing the current produced from selected hybridized nucleic acids extracted from a culture of said selected cells with and without the candidate drug

wherein the difference in current produced is indicative of a candidate drug that modulates cell function.

40 18. The candidate drug of claim 17 wherein the amount of current generated is indicative of drug candidate interaction with said selected nucleic acids produced by the selected cells.

45 19. The candidate drug of claim 17 wherein the selected nucleic acid is a mRNA.

20. The candidate drug of claim 17 wherein the selected nucleic acid is from a pathogenic organism.

50 21. The candidate drug of claim 17 wherein the selected nucleic acid is from a cancer gene.